

1. PLAGIARISM OR HIRING OF GHOST WRITER(S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM AWARD OF DEGREE/CERTIFICATE, IF FOUND AT ANY STAGE.
2. SUBMITTING ASSIGNMENTS BORROWED OR STOLEN FROM OTHER(S) ONE WILL be PENLIZED AS DEFINED IN "AIOU PLAGIARISM POLICY"

ASSIGNMENT No. 1

(Units 1-4)

Attempt all the questions.

Q.1 Probability Theory

- a) Find the sample space for choosing an odd number from 1 to 10 at random.
- b) What is the difference between mutually exclusive events and collectively exhaustive events?
- c) There are 16 green, 20 red and 24 yellow balls in a basket. If we pick a ball at random what is the probability that
 - i. The ball is green.
 - ii. The ball is not green and red.

Q.2 Random Variables

- a) Define random variable. What is the difference between discrete random variable and continuous random variable?
- b) The number of fire alarms pulled each hour fluctuates in Islamabad. Probability table of different alarms per hour is shown

No. of Alarm Pulled	Probability
Less than 8	0.12
8	0.24
9	0.28
10	0.26
More than 10	0.10

What is the probability that

- i. more than 8 alarms will be pulled.
- ii. between 8 and 9 alarms (both inclusive) will be pulled.
- c) Construct the discrete probability distribution which corresponds to the experiment of tossing a fair coin three times. Suppose the random variable X equals the number of heads occurring in three tosses. What is the probability of two or more heads?

Q.3 Equations

- a) Solve the second-degree equation and find the nature of its roots. $y^2 - y - 2 = 0$
- b) Solve the inequality and represent solution on the real line. $2x^2 + 5x + 3 < 0$
- c) Find the point of intersection of the following lines if it exists

$$\begin{aligned} x + 2y &= 3 \\ 2x - y &= 1 \end{aligned}$$

d) Solve the following first-degree equations:

I. $8x - 6 = 5x + 3$

II. $-15 + 35x = 8x - 9$

III. $(x + 9) - (-6 + 4x) + 4 = 0$

Q.4 Equations

a) Solve the following quadratic equations using the quadratic formula:

i. $4x^2 + 3x - 1 = 0$

ii. $4t^2 - 64 = 0$

b) A railing is to enclose a rectangular area of 1800 square feet. The length of the plot is twice the width. How much railing must be used?

Q.5 Linear Equations

a) Let C mean Celsius degree and F means Fahrenheit temperature scale. Find a linear equation for C if its slope is $5/9$ and C -intercept is $-100/9$.

b) Solve the linear equation $y = 2x + 1$.

c) A company has fixed costs of \$8,000 for plant and equipment and variable costs of \$1600 for each unit of output. What is the total cost at varying levels of output?

d) Find the equation of the straight line that has slope $m = 5$ and passes through the point $(-10, -16)$.

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ASSIGNMENT No. 2

(Units 5-9)

Q.1 Matrices

- a) Solve the following system of linear equations using matrices.

$$2x_1 + 3x_2 - 4x_3 = -4$$

$$x_1 - x_2 + x_3 = 2$$

$$x_1 + 2x_2 + 3x_3 = 14$$

- b) Given $A = \begin{bmatrix} 2 & -4 & 1 \\ 4 & 0 & -3 \\ -1 & 3 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ 1 & 2 \\ 2 & 1 \end{bmatrix}$ find the product $AB = ?$

- c) Mr. Asad bought 3 kg sugar, 10 kg wheat and 1 kg salt from the local market at the rates of Rs. 50, Rs. 20 and Rs. 15 per kg respectively. If the prices of these items on Sunday market are Rs. 45, Rs. 16 and Rs. 12 per kg respectively and the one-way fare to the Sunday market is Rs. 15. Using matrices multiplication, find his net profit or loss.

Q.2 Determinants and Inverses of Matrices

- a) Evaluate the following determinants:

i. $\begin{vmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{vmatrix}$

ii. $\begin{vmatrix} 2a & a & a \\ b & 2b & b \\ c & c & 2c \end{vmatrix}$

- b) Find the inverse of the given matrix $A = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ using Gaussian reduction method.

- c) If $A = \begin{bmatrix} 1 & -2 & -3 \\ 2 & 0 & 1 \\ -4 & 6 & 8 \end{bmatrix}$, find $|A|$.

Q.3 Differentiation

- a) Find the derivative of the function $f(x) = 15x^{100} - 3x^{12} + 5x - 46$.

- b) For the function $f(x) = x^2 - 2x + 3$ find the point where the tangent line of this function is horizontal.

- c) The distance covered by a car in kilo meters is given as a function of time in hours by the following relation $f(t) = t^2 + 50t + 15$ Find the instantaneous velocity of car at $t=2$
- d) The position of a particle moving along a straight line at time t is given by $s = f(t) = 2t^2 + 7$. Find the instantaneous rate of change at $t = 12$ seconds.
- e) The production costs per week for producing x widgets in a factory is given by $C(x) = 500 + 350x - 0.09x^2$. Calculate the cost to produce the 301st widget at $x = 300$.
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Q.4 Partial Derivatives

- a) Find the 2nd order derivative of the function: $f(x) = \sqrt[3]{x^5}$
- b) Find the values of $\partial f / \partial x$ and $\partial f / \partial y$ at the point $(4, -5)$ if $f(x, y) = x^2 + 3xy^2 + y - 1$.
- c) Find the second partial derivatives of the function $f(x, y) = 3x^{2y} + 2y^3$.
- d) If $f(x, y) = x^2 + y^2 + 2xy$, find the critical points and determine if they are maxima or minima.
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Q.5 Optimization

- a) Find the interval on which f is increasing, decreasing, concave up, and concave down for $f(x) = 2x^3 - 4x - 1$.
- b) A company manufactures two types of a certain product. The joint cost function for producing x units of product A and y units of product B is given by $c = x^2 + 8xy + 40$. Find the quantity of each that results in the lowest cost.
- c) A manufacturer has determined a cost function which expresses the annual cost of purchasing, owing and maintaining its raw material inventory (C) as a function of the size of each order (q). The cost function is $C = \frac{51200}{q} + 80q + 750000$
- I. Determine the order size q which minimizes inventory cost C .
 - II. What are minimum inventory costs expected to equal.
- d) The total cost and total revenue functions for a product are

$$C(q) = 500 + 100q + 0.5q^2 \text{ and } R(q) = 500q.$$

Find the profit-maximizing level of output.
